

sink material." It is noted that claim 18 is directed to a method and not an apparatus. Accordingly, claim 18 defines the step of "directly heating" the layered substrate as being conducted without using a heat sink material, rather than defining the layered substrate and/or radiation source as structurally not including a heat sink material.

That is, the limitation "without any heat sink material" qualifies the heating step rather than the layered substrate and/or radiation source. Therefore, claim 18 embodies one, both, or neither of the layered substrate and radiation source as including heat sink material, as long as the process of heating the layered substrate by the radiation source is conducted "without using any heat sink material." In order to clarify the intended meaning, claim 18 has been amended to include the word "using."

The Examiner further alleges that the preamble of claim 18 is not proper. In order to expedite prosecution, the preamble of claim 18 has been amended so as to obviate the alleged indefiniteness.

Based on the foregoing, it is respectfully requested that the rejection of claim 18 under 35 U.S.C. § 112, second paragraph, be withdrawn.

## **II. CLAIMS 11-12 ARE NOT ANTICIPATED BY GMITTER ET AL.**

Claims 11-12 stand rejected under 35 U.S.C. § 102 as being anticipated by Gmitter et al. ('931). Claim 11 is independent. In order to expedite prosecution, claim 11 has been amended to clarify the distinction between the present invention and Gmitter et al..

Claim 11 recites in pertinent part, "growing an epitaxial layer on a layered substrate *which exhibits bowing*" (emphasis added). In contrast, the epitaxial layers 3,4 of Gmitter et al. are shown to be grown on a flat substrate 1,2. Gmitter et al. is

completely silent as to the bowing problem discussed in Applicant's specification (*see* page 10, line 27 - page 11, line 25 of Applicant's specification and Figures 2a-2c). Further, Gmitter et al. is silent as to the properties (e.g., relative dimensions, modulus, thermal coefficients, etc.) of the thin release film 2 and substrate 1, as well as the specific process by which the film 2 is formed on the substrate 1.

Accordingly, Gmitter et al. is completely silent as to the *thin* release film 2 (rendering it unlikely to induce bowing) and substrate 1 exhibiting bowing so that the subsequent process of growing an epitaxial layer 3,4 of Gmitter et al. is not performed "on a layered substrate which exhibits bowing", let alone "so as to flatten said layered substrate" as recited in claim 28 (i.e., the layered substrate 1,2 is already flat).

As anticipation under 35 U.S.C. § 102 requires that each and every element of the claim be disclosed in a single prior art reference, *Akzo N.V. v. U.S. Int'l Trade Commission*, 808 F.2d 1471 (Fed. Cir. 1986), and because Gmitter et al. does not disclose or suggest, *inter alia*, "growing an epitaxial layer on a layered substrate which exhibits bowing", it is submitted that Gmitter et al. does not anticipate claim 11, nor any claim dependent thereon.

Further, Gmitter et al. does not disclose "selective etching a portion of the epitaxial layer" as recited in claim 12. In contrast, Gmitter et al. discloses etching away a portion of the alleged layered substrate 2.

Based on all the foregoing, it is submitted that claims 11 and 12 are patentable over Gmitter et al.. Accordingly, it is respectfully requested that the rejection of claims 11-12 under 35 U.S.C. § 102 over Gmitter et al., be withdrawn.

**III. CLAIMS 15-16 AND 19-21 ARE NOT ANTICIPATED BY HANSSON**

Claims 15-16 and 19-21 stand rejected under 35 U.S.C. § 102 as being anticipated by Hansson (USP No. 6,316,361 and DE 198 47 101). Claims 15 and 19 are independent. In order to expedite prosecution, claims 15 and 19 have been amended to clarify the distinction between the present invention and Hansson.

Each of claims 15 and 19 recite in pertinent part, "directly heating [a/the] substrate by a radiation source without using any heat sink material." In contrast, Hansson heats the substrate 7 *indirectly* using lamps 15 *and heat sink material* (e.g., housing parts of chamber positioned between the lamps 15 and respective sides of substrate 7).

As anticipation under 35 U.S.C. § 102 requires that each and every element of the claim be disclosed in a single prior art reference, *Akzo N.V. v. U.S. Int'l Trade Commission*, 808 F.2d 1471 (Fed. Cir. 1986), and because Hansson does not disclose or suggest, *inter alia*, "directly heating a/the substrate by a radiation source without using any heat sink material", it is submitted that Hansson does not anticipate claims 15 and 19, nor any claim dependent thereon.

Based on all the foregoing, it is submitted that claims 15, 16 and 19-21 are patentable over Hansson. Accordingly, it is respectfully requested that the rejection of claims 15, 16 and 19-21 under 35 U.S.C. § 102 over Hansson, be withdrawn.

**IV. CLAIMS 15-16 ARE NOT ANTICIPATED BY ROHM CO LTD**

Claims 15-16 stand rejected under 35 U.S.C. § 102 as being anticipated by Rohm. This rejection is respectfully traversed for the following reasons.

Claim 15 recites in pertinent part, "supplying a set of reactant species on one side of the substrate ...; and ... supplying *another set* of reactant species on the other side of the substrate ..." (emphasis added). In contrast, Rohm discloses using a *single* set of reactant species for growing epitaxial layers on opposing sides of a wafer simultaneously.

As anticipation under 35 U.S.C. § 102 requires that each and every element of the claim be disclosed in a single prior art reference, *Akzo N.V. v. U.S. Int'l Trade Commission*, 808 F.2d 1471 (Fed. Cir. 1986), and because Rohm does not disclose or suggest, *inter alia*, "supplying a set of reactant species on one side of the substrate ...; and ... supplying another set of reactant species on the other side of the substrate ...", it is submitted that Rohm does not anticipate claim 15, nor any claim dependent thereon.

Based on the foregoing, it is submitted that claims 15 and 16 are patentable over Rohm. Accordingly, it is respectfully requested that the rejection of claims 15 and 16 under 35 U.S.C. § 102 over Rohm, be withdrawn.

**V. CLAIMS 11-18 ARE NOT ANTICIPATED BY MANABE ET AL.**

Claims 11-18 stand rejected under 35 U.S.C. § 102 as being anticipated by Manabe et al. ('557). This rejection is respectfully traversed for the following reasons.

**A. CLAIM 11**

Claim 11 recites in pertinent part, "growing an epitaxial layer on a layered substrate which exhibits bowing." In contrast, the epitaxial layers 3,4 of Manabe et al. are shown to be grown on a flat substrate 1,2. Manabe et al. is completely silent as to the bowing problem discussed in Applicant's specification (*see* page 10, line 27 - page 11, line 25 of Applicant's specification and Figures 2a-2c). In fact, Manabe et al. leads away

from exhibiting bowing because the *same* compositional ZnO layers 2a, 2b are formed on both sides of the substrate 1 so as to counter-act any potential bowing forces.

As anticipation under 35 U.S.C. § 102 requires that each and every element of the claim be disclosed in a single prior art reference, *Akzo N.V. v. U.S. Int'l Trade Commission*, 808 F.2d 1471 (Fed. Cir. 1986), and because *Manabe et al.* does not disclose or suggest, *inter alia*, growing an epitaxial layer "on a layered substrate which exhibits bowing", it is submitted that *Manabe et al.* does not anticipate claim 11, nor any claim dependent thereon.

Further, *Manabe et al.* does not disclose "selective etching a portion of the epitaxial layer" as recited in claim 12. In contrast, *Manabe et al.* discloses etching away a portion of the alleged layered substrate 2a,2b.

#### **B. CLAIMS 15 AND 18**

Claims 15 and 18 recite in pertinent part, "directly heating" a substrate by a radiation source without using any heat sink material. *Manabe et al.* is completely silent as to the process used for heating the substrate 1,2. As such, *Manabe et al.* does not disclose or suggest a step of "directly heating". It appears the Examiner's position was based on the confusion arising under § 112. It is submitted that Applicant's remarks regarding the § 112 rejection of claim 18 clarifies the distinction between claims 15,18 and *Manabe et al.*.

Further, claim 15 has been amended to include limitations from claim 19, which the Examiner did not reject over *Manabe et al.*. For example, *Manabe et al.* does not disclose "supplying a set of reactant species on one side of the substrate; [and] supplying *another set* of reactant species on the other side of the substrate." Rather, it is quite possible that *Manabe et al.* uses a *single* set of reactant gases to form the alleged growth layers

simultaneously (similar to Rohm). It is noted that "inherency may not be established by probabilities or possibilities" (see **Scaltech Inc. v. Retec/Tetra**, 178 F.3d 1378 (Fed. Cir. 1999)). Even further, Manabe et al. is completely silent as to forming the opposing growth layers "without cooling down to room temperature" as further recited in claim 15.

As anticipation under 35 U.S.C. § 102 requires that each and every element of the claim be disclosed in a single prior art reference, *Akzo N.V. v. U.S. Int'l Trade Commission*, 808 F.2d 1471 (Fed. Cir. 1986), based on the foregoing, it is submitted that Manabe et al. does not anticipate claims 15 and 18, nor any claim dependent thereon.

Based on all the foregoing, it is submitted that claims 11-18 are patentable over Manabe et al.. Accordingly, it is respectfully requested that the rejection of claims 11-18 under 35 U.S.C. § 102 over Manabe et al., be withdrawn.

**VI. CLAIMS 22 AND 23 ARE PATENTABLE OVER HANSSON IN VIEW OF MANABE ET AL.**

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Claims 22 and 23 stand rejected under 35 U.S.C. § 103 over Hansson in view of Manabe et al.. This rejection is respectfully traversed for the following reasons.

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claim 19 is patentable for the reasons set forth above, it is respectfully submitted that claims 22 and 23 which depend on claim 19 are also patentable. In addition, it is submitted that claims 22 and 23 are patentable based on their own merits by adding novel and non-obvious features to the combination.

It is respectfully submitted that the proposed modification of Hansson in view of Manabe et al. is improper because the Examiner has not provided the requisite *objective* evidence *from the prior art* that "suggests the desirability" of the proposed combination. As is well known in patent law, a *prima facie* showing of obviousness can only be established if the prior art "suggests the desirability" of the proposed combination using *objective* evidence. The Examiner is directed to MPEP § 2143.01 under the subsection entitled "Fact that References Can Be Combined or Modified is Not Sufficient to Establish *Prima Facie* Obviousness", which sets forth the applicable standard:

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. (*In re Mills*, 16 USPQ2d 1430 (Fed. Cir. 1990)).

In the instant case, even assuming *arguendo* that Hansson can be modified by Manabe et al., it is submitted that the "mere fact that [Hansson and Manabe et al.] can be combined ... does not render the resultant combination obvious" because nowhere does the *prior art* "suggest the desirability of the combination" as set forth by the Examiner. The Examiner is further directed to MPEP § 2143.01 under the subsection entitled "Fact that the Claimed Invention is Within the Capabilities of One of Ordinary Skill in the Art is Not Sufficient by Itself to Establish *Prima Facie* Obviousness", which sets forth the applicable standard:

A statement that modifications of the prior art to meet the claimed invention would have been [obvious] because the references relied upon teach that all aspects of the claimed invention were *individually* known in the art is *not* sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. (citing *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993)).

In the instant case, even assuming *arguendo* that Hansson and Manabe et al. "teach that all aspects of the claimed invention [are] individually known in the art", it is submitted that such a conclusion "is not sufficient to establish a *prima facie* case of obviousness" because there is no *objective* reason on the record to combine the teachings of the cited prior art. In contrast, the cited prior art is completely silent as to suggesting the *combination* of the process and materials as recited in claims 22 and 23.

At best, the Examiner has attempted to show only that the elements of the claimed invention are *individually* known without providing a *prima facie* showing of obviousness that the *combination* of elements recited in the claims is known or suggested in the art. For all the foregoing reasons, it is submitted that the proposed combination of Hansson in view of Manabe et al. is improper.

Based on all the foregoing, it is submitted that claims 22 and 23 are patentable over Hansson in view of Manabe et al.. Accordingly, it is respectfully requested that the rejection of claims 22 and 23 under 35 U.S.C. § 103 over Hansson in view of Manabe et al., be withdrawn.

## VII. NEW CLAIMS

New claims 24-28 are submitted to be allowable based on their own merits by adding novel and non-obvious features to the combination, in addition to being dependent on novel independent claims. For example, claim 28 recites that "the step of growing an epitaxial layer on a layered substrate which exhibits bowing is conducted so as to flatten said bowed layered substrate."



The cited prior art is completely silent as to the bowing problem, let alone suggest the required steps needed to cure the bowing (e.g., proper dimensions, modulus, thermal coefficients, etc.; *see* page 10, line 27 - page 11, line 25 of Applicant's specification and Figures 2a-2c).


### **VIII. CONCLUSION**

Having fully and completely responded to the Office Action, Applicant submits that all of the claims are now in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicant's attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

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**APPENDIX**

11. (Amended) An epitaxial growth method comprising:

growing an epitaxial layer on a layered substrate which exhibits bowing, wherein the layered substrate has at least two layers, wherein at least two of the layers have different thermal coefficients[; and

removing the layered substrate after growing the epitaxial layer].

12. (Amended) The epitaxial growth method of claim 11 [wherein removing comprises] further comprising the step of selective etching [of a top layer of the layered substrate] a portion of the epitaxial layer.

15. (Amended) An epitaxial growth method comprising:

directly heating a substrate by a radiation source without using any heat sink material;

supplying a set of reactant species on one side of the substrate for growing an epitaxial layer on [a] the first side of [a] the substrate at an elevated temperature; and

without cooling down to room temperature, supplying another set of reactant species on the other side of the substrate for growing an epitaxial layer on an opposing side of the substrate.

18. (Amended) [An] A heating [epitaxial growth] method comprising directly heating a semiconductor layered substrate by a radiation source without using any heat sink

material, wherein each layer of the semiconductor layered substrate has a different thermal expansion coefficient.

19. (Amended) An epitaxial growth method comprising:

placing a substrate in a system so that each side of the substrate is not completely covered by any parts or susceptor blocks;

directly heating the substrate by a radiation source without using any heat sink material;

supplying a set of reactant species on one side of the substrate;

supplying another set of reactant species on the other side of the substrate; and

preventing mixing of the two sets of reactant species.